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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/026,278	12/18/2001	Eko N. Onggosanusi	TI-32854	8075
23494	7590	06/05/2006	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			WONG, LINDA	
			ART UNIT	PAPER NUMBER
			2611	

DATE MAILED: 06/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/026,278

Applicant(s)

ONGGOSANUSI ET AL.

Examiner

Linda Wong

Art Unit

2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-69 and 71-74 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 60-67 is/are allowed.
- 6) ☒ Claim(s) 42-44, 47-49, 53-59, 68, 69, 71, 73 and 74 is/are rejected.
- 7) ☒ Claim(s) 1-41, 45, 46, 50-52 and 72 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                                    | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.
2. Applicant's arguments, see Applicant's Remarks, filed 4/17/2006, with respect to claims 1-41,60-67 have been fully considered and are persuasive. The 35 USC 103 of claims 1-41,60-67 has been withdrawn.
3. Applicant's arguments, see Applicant's Remarks, filed 4/17/2006, with respect to the rejection(s) of claim(s) 42-77,47-49,53-59,68-74 under the admitted prior art in view of Dettman and further in view of Mueller et al (US Patent No.: 5323322) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Piret et al (US Patent No.: 6560291).

### ***Claim Objections***

4. **Claim 1** recites the limitation "circuitry for multiplying the signals times a conjugate transpose of an estimate of the channel effect and times a conjugate transpose of a linear basis transformation matrix". Within the limitation, the terminology "multiplying" and "times" is used to show the mathematical computation is being performed, but because of the redundancy, the claim seems to indicate that multiplication is occurring twice. To eliminate the ambiguous interpretation, it is suggested by the examiner to adjust the claim as follows: "circuitry for multiplying

the signals ~~times~~ [with] a conjugate transpose of an estimate of the channel effect  
and ~~times~~ [with] a conjugate transpose of a linear basis transformation matrix”

5. **Claim 31** has the same objections as stated in claim 1.
6. **Claim 39** has the same objections as stated in claim 1.
7. **Claim 42** recites the limitation "the receiver". There is insufficient antecedent basis for this limitation in the claim.
8. **Claim 42, lines 6-8**, has the same objections as stated in claim 1.
9. **Claim 68** recites the limitations of “modulating the plurality of signals” and “multiplying the plurality of signals by the matrix”. In Fig. 3, the transmitter receives a plurality of signals (Fig. 3, label Bi), the plurality of signals are then modulated (Fig. 3, label 20') and the modulated signal is then multiplied by the matrix (Fig. 3, label 76). The recited limitation does not match the specification.
10. **Claim 69** recites the limitation “spreading the plurality of signals”. In Fig. 3, the transmitter receives a plurality of signals (Fig. 3, label Bi), then modulates the plurality of signals received (Fig. 3, label 20') and the modulated signals are then spread with a code (Fig. 3, label 24'). The recited limitation does not match the specification.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. **Claims 42-44,47-49,54-59,68-69** are rejected under 35 U.S.C. 103(a) as being unpatentable over Piret et al (US Patent No.: 6560291) in view of the admitted prior art (Fig. 2-3) and further in view of Dettman (Introduction to Linear Algebra and Differential Equations).

a. **Claim 42**, Piret et al discloses a transmitter and receiver (Fig. 1, label transmitter and Fig. 3, label 209), wherein interference inherently occurs in the transmission channel (Col. 1, lines 37-44 and Col. 4, lines 47-59), multiplying the transmitted symbols with a matrix (Col. 4, lines 47-59), and circuitry for selecting a sub-matrix (Col. 4, lines 62-67), wherein communication between the receiver and transmitter is suggested by Piret et al to occur through the bus shown in Fig. 4a and 4b, wherein information such as transmitted data (Col. 6, lines 35-50), information received and information determining the transmission error can be communicated from the transmitter to the receiver. Although Piret et al fails to teach a plurality of transmit antennas, the admitted prior art discloses a plurality of transmitting antennas. (Fig. 2, label tat3 and tat4) It would be obvious to one skilled in the art to incorporate a plurality of transmitters to provide a more robust system. Although Piret et al fails to teach a linear basis transformation matrix, Piret et al discloses linear matrices (Col. 10, lines 44-46). Transformation of a matrix is well known in the art. It would be obvious to one skilled in the art to calculate a transformation of the linear

matrix disclosed by Piret et al to transform the elements from one quadrant to another. (Dettman, pages 140-169)

- b. **Claim 43**, Piret et al discloses selecting a linear sub-matrix (Col. 4, lines 62-67, Col. 10, lines 44-46) in response to the information sent (Col. 6, lines 35-50), information received and information determining the transmission error (Fig. 4a and 4b) and circuitry for providing communication to transmitter via a feedback channel (Fig. 1, bus between input port and output port).
- c. **Claim 44**, Piret et al discloses selecting a sub-matrix from a set, which indicates a finite set. (Col. 3, lines 44-50)
- d. **Claim 47**, it is inherent within the operation of a transformation to rotate, thus it would be obvious to one skilled in the art to transform the linear matrix disclosed by Piret et al to transform the elements from one quadrant to another. (Dettman, pages 140-169)
- e. **Claim 48**, it is inherent within the operation of a transformation to rotate and change the phase of the components in the matrix, thus it would be obvious to one skilled in the art to transform the linear matrix disclosed by Piret et al to transform the elements from one quadrant to another. (Dettman, pages 140-169)
- a. **Claim 49**, Dettman discloses the matrix recited in the claim as a standard representation of a linear transformation matrix. (page 167, example 4.5.3)
- f. **Claims 54 and 55**, Although Piret et al fails to disclose TDMA or CDMA signals, Piret et al discloses a wireless system, wherein TDMA or CDMA are well known

types of multiplexing methods used to coordinate multiple users. It would be obvious to one skilled in the art to received within a wireless system TDMA or CDMA signals to provide appropriate recognition of users transmitting at a certain time or code.

- g. **Claim 56**, Although Piret et al fails to disclose PSK, BPSK, and QAM selected signals, such modulation types are well known in the art and it would be obvious to one skilled in the art to modulate the received signals using any of these types of modulation based on the designers choice and the capacity of the system.
- h. **Claim 57**, Although Piret et al fails to teach a plurality of reception antennas, the admitted prior art discloses a plurality of reception antennas. (Fig. 2, label rat3 and rat4) It would be obvious to one skilled in the art to incorporate a plurality of transmitters to provide a more robust system.
- i. **Claims 58 and 59**, Although Piret et al fails to teach the number of the plurality of transmit antennas is equivalent or less to the number of reception antennas, the admitted prior art discloses an equivalent number of plurality of transmitting antennas and reception antennas. (Fig. 2, labels tat3 and tat4 and rat3 and rat4) Although the admitted prior art fails to teach the number of transmitter is less than receivers, It would be obvious to one skilled in the art to provide less transmitters than receivers based on design choice.
- j. **Claim 68** inherits all the limitations of claim 42.

- k. **Claim 69**, Although Piret et al fails to disclose spreading the plurality of signals in response to a code, the admitted prior art discloses such a limitation. (Fig. 2, label 24) It would be obvious to one skilled in the art to incorporate spreading so to spread the signal to be transmitted over a wide range of frequencies.
12. **Claims 71,73-74** are rejected under 35 U.S.C. 103(a) as being unpatentable over Piret et al (US Patent No.: 6560291) in view of the admitted prior art (Fig. 2-3), further in view of Dettman (Introduction to Linear Algebra and Differential Equations) and further in view of Foschini et al (US Patent No.: 7050510).
- a. **Claim 71**, Although Piret et al fails to discloses encoding, interleaving and converting the plurality of signals to serial signals, Foschini et al discloses encoding the plurality of signals (Fig. 1, labels 103-1-103-L), interleaving the plurality of signals (Fig. 1, label 105) and converting the plurality of signals into serial signals, one for each transmitter (Fig. 1, labels 107-1-107-4). It would be obvious to one skilled in the art to incorporate such components as disclosed by Foschini et al into Piret et al's invention to improve capacity. (Col. 1, lines 14-30)
  - b. **Claim 73** inherits all the limitations of claim 42.
  - c. **Claim 74**, Foschini et al discloses "the coding of each of the data substreams is independent of i.e., decoupled from the coding of any of other data substreams." (Col. 2, lines 37-41)

13. **Claim 53** are rejected under 35 U.S.C. 103(a) as being unpatentable over Piret et al (US Patent No.: 6560291) in view of the admitted prior art (Fig. 2-3), further in view of Dettman (Introduction to Linear Algebra and Differential Equations) and further in view of Bevan et al. (US Patent No.: 6897897)
- a. **Claim 53**, Although the admitted prior art, Dettman and Piret et al. do not teach a space time block coded decoding circuitry, Bevan et al discloses a space time coding multi-input multi-output system using space time decoders. (Fig. 5, label Decoder) It would be obvious to one skilled in the art to incorporate the admitted prior art, Piret et al and Bevan et al's inventions to improve power efficiency and bandwidth efficiency. (Col. 1, lines 32-40)

***Allowable Subject Matter***

14. **Claims 45-46,50-52,72** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
15. **Claims 60-67** are allowed over prior art.
16. **Claims 1,31,39** would be allowable if rewritten to overcome all objection(s) as stated in this office action.
17. **Claims 2-30,32-38,40-41** are objected as being dependent upon an objected base claim, but would be allowable if the independent claim is rewritten to overcome all objection(s) as stated in the office action.

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**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Linda Wong whose telephone number is 571-272-6044. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on (571) 272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Linda Wong

A handwritten signature in black ink, appearing to read 'Linda Wong', with a horizontal line extending from the end of the signature.

**DACHA  
PRIMARY EXAMINER**